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WHAT YOU SHOULD KNOW ABOUT THE MASSACHUSETTS RIGHT TO KNOW LAW

Supplementary Handout Materials
Prepared By

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University Health Services
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Massachusetts Right to Know Law

I. The Act

On November 4, 1983 Governor Dukakis signed Massachusetts General Law C.111F commonly known as the "Massachusetts Right to Know Law" (MRKL). The responsibility for administering the provisions of this Law rests with the Departments of Public Health, Labor and Industries, and Environmental Quality Engineering. The effective date of the Law will be 90 days from the date of promulgation of Department rules. The Law takes effect on September 26, 1984.

II. The List

The Department of Public Health has established the Massachusetts Substance List (MSL). Only those substances specifically enumerated on the MSL shall be subject to the provisions of the MRKL. The MSL will be updated annually. Any material on the MSL is considered toxic if at least 1% of a mixture (2% as an impurity) is contained therein.

III. MSDS

The employer must show diligent effort in acquiring Material Safety Data Sheets (MSDS) for all toxic substances s/he manufactures, uses, or stores. The MSDS's must be available at a central location in the workplace and retained for 30 years. The employer must file a copy of MSDS's with the Department of Environmental Quality Engineering.

IV. Labeling

Each container shall be labeled with the chemical name unless said name is a trade secret. Additionally, each container shall be labeled with the National Fire Protection Association code, if applicable, except for containers of 5 gal. or less or 30 lbs. or less.

Piping or storage vessels must also be labeled, but only in areas of access to the contents.

V. Access to Disclosure of MSDS's

An employee may request, in writing, a copy of the MSDS and it must be provided within 4 working days. The employee's designated representative (Union) has access to the MSDS. An employee can refuse to work (except essential services personnel) if the MSDS is not provided within 4 working days unless the employer can demonstrate that s/he has shown "diligent effort" in attempting to obtain the MSDS. Copies of the MSDS must be filed with the town Municipal Coordinator upon request. A community resident may file a petition requesting an investigation involving exposure information with the Municipal Coordinator, who must respond in a timely manner. Physicians may obtain access to the MSDS if s/he feels a suspected involvment of a hazardous substance.

VI. Training

The employer shall furnish employees with instruction on

the nature and effect of those hazardous substances present in the workplace either in written form or in training programs.

VII. Exemptions

Research laboratories used primarily for non-routine testing or experimentation and not involved in the production of manufactured goods may apply for an exemption through the Massachusetts Department of Public Health.

NOTE - copies of the "Massachusetts Right to Know Law" are on reserve at the following University libraries: Music Library (149 Fine Arts Center), Physical Sciences Library (Lederle GRC, 2nd floor), Biological Sciences Library (214, Morrill Science Center) and the Goodell Library.

For additional information on the MRKL please contact Environmental Health & Safety, Morrill N414, 5-2682.

REQUIREMENTS OF THE RIGHT TO KNOW LAW

MATERIAL SAFETY DATA SHEET

Material Safety Data Sheet or MSDS means the written document which sets forth the following information for a toxic or hazardous substance:

1. *The chemical name, any common names, and the CAS number of the toxic or hazardous substance; and*
2. *The hazards or other risks in the use of the toxic or hazardous substance, including;*

   a. *the potential for fire, explosion, corrosivity, and reactivity;*
   b. *the acute and chronic health effects of the risks from exposure; including the medical conditions that might be aggravated by exposure; and*
   c. *the potential routes of exposure and symptoms of overexposure; and*

3. *The proper precautions, handling practices, necessary personal protective equipment, and other safety precautions in the use of or exposure to the toxic or hazardous substance, including appropriate emergency treatment in case of overexposure at hazardous levels; and*
4. *The emergency procedures for spills, fire, disposal and first aid; and*
5. *A description in lay terms, of the specific potential health risks posed by the toxic or hazardous substance intended to alert any person reading this information, including but not limited to carcinogenic, mutagenic, teratogenic, or neurotoxic effects; and*
6. *The month and year that the information was compiled and the name, address, and emergency telephone number of the manufacturer responsible for preparing the information.*

MIXTURE MATERIAL SAFETY DATA SHEETS

1. *Name. The common name of the mixture in addition to the chemical name of each toxic or hazardous substance shall be listed on the MSDS.*

2. *Ingredients. All toxic or hazardous substances present in mixtures shall be listed in the MSDS.*

3. *Percentages. The percentage of each toxic or hazardous substance listed on the MSDS shall be based on the on the relative amounts present in the mixture unless the percentage is a valid trade secret.*

4. *CAS Number. The applicable CAS Numbers shall be shown for each toxic substance present in mixture.*

5. *Special Information on Mixtures. Special precations and addtional emergency precedures arising from the nature of the mixture and the source of this information shall be listed.*

LABELS

1. *Location. Labels shall be prominently located on the container in its upright position when the container is in its usual postion for use, so as to be legible.*

2. *Type. Names an labels shall be in bold face letters.*

3. *Legibility. The chemical name and the NFPA Code, if applicable, of the toxic or hazardous substances, in English and on a distinctly contrasting background, shall be affixed to the container.*

4. *Weather Exposure. Labels on containers exposed to the elements of the weather shall be such that the reading matter is clear and conspicuous at all times and will not be defaced or obliterated by rain, snow or other adverse elements of the weather.*

5. *Secondary Containers. If a labeled container is covered by a secondary container or a covering that remains in place while the contents of the container are withdrawn or used therefrom, the required labels shall also appear on the secondary container or covering.*

6. *Mixtures. Containers of mixtures shall be labeled with the chemical name listed on the MSDS for each toxic or hazardous in the mixture. It is recommended that containers of mixtures be also labeled with the common name of the mixture.*

7. *Typography Size. The size of type on labels shall substantially comply with the following minimum requirements:*

Over 1 Gallon or 5 lbs.	*3/16 in.*
Over 5 Gallons or 30 lbs.	*1/4 in.*
Over 10 Gallons or 100 lbs.	*1/2 in.*

8. *When a substance has been designated a carcinogen, mutagen, teratogen, or neurotoxin, and the name of said substance is withheld from the label as a trade secret, the label shall display the letter "C", "M", "T", or "N", indicating the substance is, respectively, a carcinogen, mutagen, teratogen, or neurotixin.*

MATERIALS EXEMPT FROM RIGHT TO KNOW LAW

The Right to Know Law requires that employers obtain a Material Safety Data Sheet for each chemical used by them that is listed on the Massachusetts' Substance List. The exceptions to this requirement are as follows:

(a) consumer goods (goods primarily used or bought for use by individuals for personal family or household purposes) when used in the workplace where

1. the toxic or hazardous substances contained therein are not listed as carcinogens, mutagens, teratogens, neurotoxins, or extraordinarily hazardous substances as defined by the Department of Public Health, and
2. they are not required to be labelled under M.G.L. c. 111F, s. 7(b), and
3. the substance is used in the workplace in such a manner that employee exposure is substantially equivalent to exposures resulting from consumer usage.

(b) office supplies, including those materials to be found at an employee's desk or similar work station in an office environment (for example, typewriter correction fluid, ink in pens, and glue), and toner used in photographic or other types of office copying machines, where

1. the substance is present only in amounts and forms substantially equivalent to the amount and forms generally available to consumers, and
2. the substance is used in the workplace in such a manner that employee exposure is substantially equivalent to exposures resulting from consumer usage.

(c) food stuffs.

(d) gasoline, oils and other additives in fuel tanks, engines, and other operating systems of passenger vehicles or light duty trucks where

1. the substances are present only in amounts and forms substantially equivalent to the amounts and forms generally available to consumers, and
2. the substances are used in such a manner that employee exposure is substantially equivalent to exposures resulting from consumer usage.

(e) fuel oils number 1, 2, 4, 5 and 6, natural gas, kerosene, petroleum, or propane, where used for space heating or power generation purposes, such that employees are not exposed to fumes or combustion by-products, and all required emission control equipment is used.

DEFINITIONS

ACUTE-An adverse effect on the human body with symptoms of high severity coming quickly to a crisis.

ALLERGIC SENSITIZATION-A condition acquired through exposure to a particular substance, with additional exposure causing a more severe reaction.

ASPIRATION-The removal of fluids or gases from a cavity by suction.

BRONCHITIS-The inflammation of one or more of the larger passages leading to the lungs.

CARCINOGEN-A substance that has been shown to cause malignant (cancerous) tumors.

CATALYST-A chemical which changes the rate of a chemical reaction between two other chemicals without affecting the chemical itself.

CHRONIC-An adverse effect on the human body with symptoms which develop slowly over a long period of time or which frequently recur.

CONJUNCTIVITIS-The inflammation of the delicate membrane lining the eyelids and covering the eyeball.

CORNEAL-The transparent forward part of the eye.

CYANOSIS-A bluish discoloration of the skin, especially on the face and fingers, indicating a lack of sufficient oxygen in the blood.

DERMATITIS-An inflammation of the skin.

EVAPORATION RATE-A measure of the length of time required for a given amount of a substance to evaporate, compared with the time required for an equal amount of ether or butyl acetate to evaporate.

FLAMMABLE LIMITS-(Explosive Limits)
Lower Flammable (Explosive) Limit-The lowest concentration of a combustible or flammable gas or vapor in air that will produce a flash of fire. Mixtures below this concentration are too "lean" to burn.

Upper Flammable (Explosive) Limit-The highest concentration of a combustible or flammable gas or vapor in air that will produce a flash of fire. Mixtures above this concentration are too "rich" to burn.

FLASH POINT-The lowest temperature, in farenheit, at which a liquid will give off enough flammable vapor to ignite.

INGESTION-The taking in of a substance through the mouth.

INHIBITOR-A chemical which is added to another substance to prevent an unwanted chemical change from occurring.

LAVAGE-The washing or jrrigation of an organ.

MUTAGEN-A substance that causes changes in the genetic material in cells. Many carcinogens are also mutagens.

NARCOSIS-An unconscious state caused by a drug.

NEUROTOXIN-A substance which may harm the nervous system.

ORAL DOSE(LD_{50})-The amount of a substance taken by mouth that would kill within 14 days half (50%) of those exposed. The dose is measured in milligrams per kilogram of body weight.

OXIDIZING AGENT-A chemical which gives off free oxygen in a chemical reaction.

POLYMERIZATION-A chemical reaction in which two or more small molecules combine to form larger molecules.

PULMONARY EDEMA-An abnormal accumulation of fluid in the lungs.

REACTIVITY-A measure of the tendency of a substance to undergo chemical reaction with the release of energy.

REDUCING AGENT-A chemical which absorbs oxygen in a chemical reaction.

SOLUBILITY-A measure of the amount of the substance that will dissolve in a given amount of water or other substance.

SPONTANEOUS HEATING-An increase in the internal temperature of a substance due to a chemical or physical change without the application of external heat.

STABILITY-A measure of the ability of a substance to be handled and stored without undergoing unwanted chemical changes.

SYSTEMIC-Affecting the body as a whole.

TERATOGEN-A substance which may cause damage to a fetus. Women of child bearing potential should take care to avoid exposure to substances that are teratogens.

THERMAL DECOMPOSITION-Chemical breakdown of a material brought about by exposure to heat.

THRESHOLD LIMIT VALUE(TLV)-The airborne concentration of a substance which represents conditions under which it is believed that nearly all workers may be repeatedly exposed day after day (for eight hours each day) without adverse effects.

TOXICITY-The measure of the adverse effect exerted on the human body by a poisonous material.

VAPOR DENSITY-Relates the weight of the vapors from a substance to air. This will inform the user of the substance as to whether the fumes will rise (value less than 1) or sink (value greater than 1).

VAPOR PRESSURE-The pressure of a vapor of a substance against the sides of a closed container.

VOLATILE-Evaporates quickly.

Material Safety Data Sheet

Required under USDL Safety and Health Regulations for Shipyard Employment (29 CFR 1915)

U.S. Department of Labor

Occupational Safety and Health Administration.

OMB No. 1218-0074
Expiration Date 05/31/86

Prepared- February 1981 - MSDS #375

Section I

Manufacturer's Name
General Electric Co. - Corporate Research & Development

Emergency Telephone Number
(518) 385-4085

Address (Number, Street, City, State, and ZIP Code)
Schenectady, New York 12305

Chemical Name and Synonyms: Spirit/Oil of Turpentine

Trade Name and Synonyms: Turpentine CAS #088 006 642

Chemical Family: Hydrocarbon

Formula: $C_{10}H_{16}$

Section II - Hazardous Ingredients

Paints, Preservatives, and Solvents	%	TLV (Units)	Alloys and Metallic Coatings	%	TLV (Units)
Pigments			Base Metal		
Catalyst			Alloys		
Vehicle			Metallic Coatings		
Solvents			Filler Metal Plus Coating or Core Flux		
Additives			Others Gum, wood or sulfate process turpentine	99	100 ppm 560 mg/m^3
Others			Inhalation by humans TCLo (irritant effects)		175 ppm

Hazardous Mixtures of Other Liquids, Solids or Gases

Typical Composition from USA Southern Pine:	Gum	Wood	Sulfate	%	TLV (Units)
Alpha- Pinene (CAS #000 080 568)	60-65	75-80	60-70		
Beta - Pinene (CAS #000 127 913)	25-35	0-2	20-25		
Camphene - (CAS #000 079 925)	-	4-8	-		
Other Terpenes	5-8	15-20	6-12		

Section III - Physical Data

Boiling Point (°F)	309-345	Specific Gravity (H_2O=1)	.87
Vapor Pressure (mm Hg.) @ 20° C	4	Percent Volatile by Volume (%)	98%
Vapor Density (AIR=1)	4.8	Evaporation Rate Butyl acetate =1)	<1

Solubility in Water
INSOLUBLE

Appearance and Odor
Material is a clear colorless liquid with a characteristic pungent odor.

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	Lel	Uel
90-115 F closed cup		.8%	

Extinguishing Media
Carbon dioxide, dry chemical, foam

Special Fire Fighting Procedures
Water spray may be ineffective to put out fire, but it can be used to cool fire exposed containers and surroundings.

Material can be NFPA Class IC or II.

Unusual Fire and Explosion Hazards
Autoignition at 488F/(253c) when heated, material is a moderate fire and explosion hazard. Emits acrid fumes on heating.

Form OSHA 20 (Rev. 3/84)

Section V - Health Hazard Data

Threshold Limit Value

100 ppm 8 hour Time Weighted Average

Effects of Overexposure Turpentine is a skin irritant and can cause dermatitis or chemical burns. It penetrates the skin to produce systemic effects. Chronic exposure can produce allergenic sensitization. Contact of liquid with the eyes is irritating and damaging (conjunctivitis, corneal burns). Vapors can also irritate the eyes at 175 ppm. Inhalation of vapors or mist is irritating and can produce headache, dizziness, chest pain, bronchitis, pulmonary edema, cyanosis and narcosis. Ingestion can produce nausea, serious illness, or even death (Mean lethal dose, adult 4-6 oz).

Emergency First Aid Procedures Eye contact: Promptly flush eyes with lots of running water for 15 minutes. Get medical help. Skin Contact: Wash exposed areas with warm water and soap. Remove contaminated clothing promptly (and launder before reuse). Get medical help if irritation persists. Inhalation: Remove victim from exposure. Get medical help if irritation persists or for excessive exposures. Ingestion: Get medical help promptly! Stomach pumping and lavage may be required. Give edible oil or white mineral oil to drink. Aspiration is a hazard if vomiting occurs.

Section VI - Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable	X	Material is reasonably stable when stored in a well-ventilated, cool place in suitable containers sealed to exclude air. It can undergo autoxidation in air and generate heat which can build up in a confined space, causing spontaneous combustion.

Incompatibility (Materials to Avoid) This flammable material must be kept away from strong oxidizing agents, oxidation catalysts, and sources of ignition and heat.

Hazardous Decomposition Products

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	

Section VII - Spill or Leak Procedures

Steps to be Taken in Case Material is Released or Spilled

Provide adequate explosion-proof ventilation to remove fumes from spill area.

Personnel involved in cleanup should use protection against breathing vapors or contact with liquid.

Small spills can be allowed to evaporate or be picked up with absorbent material and placed in a closed metal containe for prompt disposal.

Waste Disposal Method

Burning is recommended for waste disposal, using an approved incinerator for appreciable amounts in accordance with Federal, State and Local regulations. Do not incinerate sealed containers. Scrap turpentine can be mixed with more flammable solvents and sprayed into the incinerator.

Section VIII - Special Protection Information

Respiratory Protection (Specify Type) Use an approved chemical cartridge respirator or air supplied or self-contained respirator for non-routine or emergency exposure above the TLV.

Ventilation	Local Exhaust Provide adequate general and exhaust ventilation in areas of use to meet TLV requirements	Special
	Mechanical (General) Use approved chemical cartridge resoirator.	Other

Protective Gloves	Eye Protection
Use rubber gloves to avoid skin contact	Use chemical goggles to avoid eye contact.

Other Protective Equipment

An eye wash station and a shower should be near the workplace

Section IX - Special Precautions

Precautions to be Taken in Handling and Storing Store in a well-ventilated, cool, dry place away from sources of heat and ignition. Use of bonding and grounding of containers for transfers is recommended to avoid ignition from static sparks.

No smoking in areas of storage or use. Protect containers against physical damage. Store away from oxidizing agents.

Other Precautions Avoid inhalation of vapors or mist. Avoid contact with liquid. Do not ingest. Possibility of teratogenic effects exists for pregnant women (AIHA Journal, 1976, 423-26)

DOT classification - FLAMMABLE LIQUID OR COMBUSTIBLE LIQUID (depending on flash point).

ASPECTS OF CHEMICAL SAFETY

CARCINOGENS

Definition: Carcinogens are substances or preparations which, by inhalation, ingestion or skin penetration, can cause cancer or increase its frequency.

Health Hazards: Biologically and clinically, cancer due to occupational exposure is at present undistinguishable from cancer due to other causes. Cancer is not a single disease, but a family of different diseases (well over a hundred), each with varying characteristics.

Prevention: The following three aspects are important in decreasing the contact between workers and carcinogenic substances:

a. produce and transport carcinogens in closed systems;
b. control the working environment by monitoring levels of exposure and ensure adequate ventilation;
c. provide personal protective equipment for those workers at a higher risk of coming into contact with carcinogenic substances.

CORROSIVES

Definition: Corrosives is a non-specific term for substances which possess the property of severely damaging living (in particular human) tissue and of attacking other materials such as metals and wood.

Health Hazards: When in contact with human skin, most corrosive substances will produce chemical burns, while certain substances, such as chromic acid, produce deep ulcerations (open sores). Many corrosive substances have a defatting action on the skin and may cause dermatitis.

Prevention: Measures should be taken to prevent any planned or accidental contact with corrosive substances. Personal protective equipment should ideally include: corrosion-resistant and impervious suits or overalls, foot protection, hand and arm protection. Where corrosive gases may be expected, appropriate respiratory protective equipment is required.

EXPLOSIVES

Definition: An explosion is the release of energy in a rapid and uncontrolled manner. The energy released may be in the form of heat, light, sound and pressure.
A common source of energy for an explosion is a chemical reaction. Also, any flammable dust, vapour or gas mixed with air or other supporter of combustion, under the proper conditions, will explode when ignited.

Health Hazards: The health and physical hazards from an explosion are serious injury both to people and property, or even death. Many explosive substances are also toxic in nature and can present serious hazards to health on exposure.

Prevention: Explosion prevention is directed primarily at preventing the formation of flammable mixtures and/or removing sources of ignition. Explosive chemicals are labelled with specific precautions. In general, this will mean storing in cool, dry places, and avoiding high temperatures, sparks and detonators.

GASES

Definition: A gas is a chemical substance composed of particles of matter that are distant from each other. Gases in a compressed state (under pressure) are widely used in industry, in laboratories and for medical purposes.

Health Hazards: Many gases are hazardous or injurious to health. The toxicity, sites and modes of entry into the body, the concentration of the gas in air and its solubility in blood and tissues influence the effect of a gas on health. There are three principal sites of entry into the body: the respiratory system, the digestive system and the skin. The primary site of entry is through the lungs.
Some gases are highly flammable. Compressed gases have the added danger of the contents being under high pressure. Serious accidents may result from their misuse, abuse or mishandling.

Prevention: Store cylinders in a secure, dry, well-ventilated location and protect from rust. Eliminate the possibility of contact with sparks or flames.
Gas cylinders are usually color coded. This color code alerts everyone who handles compressed gases to be aware of the safety procedures necessary for each particular gas.
Lethal or poisonous gases can kill instantly. A self-contained breathing apparatus should be worn when working with such gases.

OXIDIZERS

Definition: An oxidizing chemical is a substance that is highly reactive and gives off free oxygen.

Health Hazards: Most oxidizing agents are highly toxic compounds. According to their biological effects they may be irritant gases. All irritant gases cause inflammation of the surface layers of tissues in the event of direct contact. Some of them cause burns of the skin and mucous membranes, and others may give rise to dermatitis.

Prevention: Workers handling toxic oxidizing agents should wear per-

sonal protective equipment, such as acid-proof protective clothing, footwear, gloves and goggles.
Due to the possibility of fire or explosion, oxidizers should be stored in cool, dry areas away from sparks and ignition sources. Direct contact with other chemicals should not be permitted.

POISONS

Definition: Poisons are substances which, through their chemical action, can cause injury or death.

Health Hazards: Poisons are generally lethal if they are ingested or eaten accidently. The mouth and mucous membranes are the primary routes of entry.
Poisons can also be inhaled. Some chemicals can be deadly if they enter through the skin. By breathing and skin contact, as well as by ingesting a poisonous chemical, lethal consequences may result.

Prevention: The main objective in dealing with poisons is to control or prevent exposure. Proper handling requires appropriate personal protective equipment, which may include gloves, respirators, impermeable suits and footwear.

SOLVENTS

Definition: Solvents are chemical liquids that dissolve other chemicals. Solvents can be used to clean things-like removing grease from equipment.

Health Hazards: A large proportion of industrial solvents are flammable liquids.
Solvents can enter the body through the lungs, skin or mouth.
Most organic solvents exhibit a narcotic effect (cause a drunken feeling). In addition, certain solvents have toxic properties. The reaction of an individual to a solvent will be determined by the specific toxicity of the solvent and by the length and extent of exposure to the solvent.
In addition to systemic effects(whole body), localized skin injury may occur.

Prevention: Containers of flammable solvents should be kept closed and away from heat, sparks and open flames. Whenever flammable or combustible liquids are transferred from one electrically-conductive container to another, both containers shall be effectively bonded to one another and grounded to prevent discharge sparks of static electricity. They should be used in well-ventilated areas. Depending on which solvent is used, the entire range of personal protective equipment may be needed.

Source: Encyclopaedia of Occupational Health and Safety. International Labour Office. 1983.

SPECIFICS FOR EMPLOYEES AT UMASS/AMHERST REGARDING HAZARDOUS CHEMICALS

In Case of Spills of Hazardous Materials:

1. Alert other employees and leave the area of the spill immediately.

2. Post the area of the spill to alert others that they should not enter.

3. Call Environmental Health & Safety (EH&S) to get assistance and/or advice on appropriate cleanup procedures.

   a. 8:00 a.m. to 5:00 p.m. call 545-2682 (EH&S main number).
   b. 5:00 p.m. to 8:00 a.m. and anytime during the weekend and holidays call 545-0600 (Physical Plant main number) and ask that the EH&S staff member on duty be paged.

   Do not expose yourself unnecessarily to hazardous substances - call EH&S.

For Proper Disposal of Hazardous Substances:

1. Call EH&S at 545-2682 and request a waste pickup for the hazardous substance. EH&S picks up waste every Thursday.

2. Be prepared to provide EH&S with the following information:

   a. Name of the hazardous substance.
   b. Size and type of container.
   c. Location of the substance.
   d. Your name, department and campus telephone number.

3. Between 5:00 p.m. and 8:00 a.m. and on weekends and holidays leave a message with the answering machine and an EH&S staff member will contact you.

When In Doubt About the Appropriate Protective Equipment to Use When Handling Hazardous Substance:

1. Consult the handouts on gloves and eyewear.

2. If further information is necessary call EH&S at 545-2682 and ask for the Environmental Hygienist.

3. Between 5:00 p.m. and 8:00 a.m. and on weekends and holidays leave a message with the answering machine and an EH&S staff member will respond to you.

Selection Chart for Eye and Face Protectors for Use in Industry, Schools, and Colleges

This Selection Chart offers general recommendations only. Final selection of eye and face protective devices is the responsibility of management and safety specialists. (For laser protection, refer to American National Standard for Safe Use of Lasers, ANSI Z136.1-1976.)

1. GOGGLES, Flexible Fitting, Regular Ventilation
2. GOGGLES, Flexible Fitting, Hooded Ventilation
3. GOGGLES, Cushioned Fitting, Rigid Body
*4. SPECTACLES, without Sideshields
5. SPECTACLES, Eyecup Type Sideshields
6. SPECTACLES, Semi-/Flat-Fold Sideshields
**7. WELDING GOGGLES, Eyecup Type, Tinted Lenses (Illustrated)

7A. CHIPPING GOGGLES, Eyecup Type, Clear Safety Lenses (Not Illustrated)
**8. WELDING GOGGLES, Coverspec Type, Tinted Lenses (Illustrated)
8A. CHIPPING GOGGLES, Coverspec Type, Clear Safety Lenses (Not Illustrated)
**9. WELDING GOGGLES, Coverspec Type, Tinted Plate Lens
10. FACE SHIELD, Plastic or Mesh Window (see caution note)
* 11. WELDING HELMET

*Non-sideshield spectacles are available for limited hazard use requiring only frontal protection.
**See Table A1, "Selection of Shade Numbers for Welding Filters," in Section A2 of the Appendix.

APPLICATIONS		
OPERATION	HAZARDS	PROTECTORS
ACETYLENE–BURNING ACETYLENE–CUTTING ACETYLENE–WELDING	SPARKS, HARMFUL RAYS, MOLTEN METAL, FLYING PARTICLES	7, 8, 9
CHEMICAL HANDLING	SPLASH, ACID BURNS, FUMES	2 (For severe exposure add 10)
CHIPPING	FLYING PARTICLES	1, 3, 4, 5, 6, 7A, 8A
ELECTRIC (ARC) WELDING	SPARKS, INTENSE RAYS, MOLTEN METAL	11 (In combination with 4, 5, 6, in tinted lenses, advisable)
FURNACE OPERATIONS	GLARE, HEAT, MOLTEN METAL	7, 8, 9 (For severe exposure add 10)
GRINDING–LIGHT	FLYING PARTICLES	1, 3, 5, 6 (For severe exposure add 10)
GRINDING–HEAVY	FLYING PARTICLES	1, 3, 7A, 8A (For severe exposure add 10)
LABORATORY	CHEMICAL SPLASH, GLASS BREAKAGE	2 (10 when in combination with 5, 6)
MACHINING	FLYING PARTICLES	1, 3, 5, 6 (For severe exposure add 10)
MOLTEN METALS	HEAT, GLARE, SPARKS, SPLASH	7, 8 (10 in combination with 5, 6, in tinted lenses)
SPOT WELDING	FLYING PARTICLES, SPARKS	1, 3, 4, 5, 6 (Tinted lenses advisable; for severe exposure add 10)

CAUTION:
- Face shields alone do not provide adequate protection.
- Plastic lenses are advised for protection against molten metal splash.
- Contact lenses, of themselves, do not provide eye protection in the industrial sense and shall not be worn in a hazardous environment without appropriate covering safety eyewear.

FIG. 17–13.—Selection chart for eye and face protectors. See also Table 17–A.

Courtesy American National Standards Institute.

Table 3.2 Glove resistance ratings (by courtesy of James North & Sons Ltd).
Resistance rating code: E—Excellent; F—Fair; G—Good; NR—Not recommended.

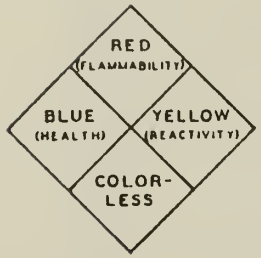
Chemical	Natural rubber	Neoprene	Nitrile	Normal pvc	High-grade pvc
Organic acids					
Acetic acid	E	E	E	E	E
Citric acid	E	E	E	E	E
Formic acid	E	E	E	E	E
Lactic acid	E	E	E	E	E
Lauric acid	E	E	E	E	E
Maleic acid	E	E	E	E	E
Oleic acid	E	E	E	E	E
Oxalic acid	E	E	E	E	E
Palmitic acid	E	E	E	E	E
Phenol	E	E	G	E	E
Propionic acid	E	E	E	E	E
Stearic acid	E	E	E	E	E
Tannic acid	E	E	E	E	E
Inorganic acids					
Arsenic acid	G	G	G	E	E
Carbonic acid	G	G	G	E	E
Chromic acid (up to 50%)	G	F	F	E*	G
Fluorosilicic acid	G	G	G	E	G
Hydrochloric acid (up to 40%)	G	G	G	E	G
Hydrofluoric acid	G	G	G	E*	G
Hydrogen sulphide (acid)	F	F	G	E	E
Hydrogen peroxide	G	G	G	E	E
Nitric acid (up to 50%)	NR	NR	NR	G*	F*
Perchloric acid	F	G	F	E*	G
Phosphoric acid	G	G	G	E	G
Sulphuric acid (up to 50%)	G	G	F	E*	G
Sulphurous acid	G	G	G	E	E
Saturated salt solutions					
Ammonium acetate	E	E	E	E	E
Ammonium carbonate	E	E	E	E	E
Ammonium lactate	E	E	E	E	E
Ammonium nitrate	E	E	E	E	E
Ammonium nitrite	E	E	E	E	E
Ammonium phosphate	E	E	E	E	E
Calcium hypochlorite	NR	G	G	E	E
Ferric chloride	E	E	E	E	E
Magnesium chloride	E	E	E	E	E
Mercuric chloride	G	G	G	E	E
Potassium chromate	E	E	E	E	E
Potassium cyanide	E	E	E	E	E
Potassium dichromate	E	E	E	E	E
Potassium halides	E	E	E	E	E
Potassium permanganate	E	E	E	E	E
Sodium carbonate	E	E	E	E	E
Sodium chloride	E	E	E	E	E
Sodium hypochlorite	NR	F	F	E	E
Sodium nitrate	E	E	E	E	E
Solutions of copper salts	G	G	G	E	E
Stannous chloride	E	E	E	E	E
Zinc chloride	E	E	E	E	E
Alkalis					
Ammonium hydroxide	E	E	E	E	E
Calcium hydroxide	E	E	E	E	E
Potassium hydroxide	E	G	G	E	E
Sodium hydroxide	E	G	G	E	E
Aliphatic hydrocarbons					
Hydraulic oil	F	G	F	G	E
Paraffins	F	G	E	G	E
Petroleum ether	F	G	E	F	G
Pine oil	G	G	E	G	E
Aromatic hydrocarbons†					
Benzene	NR	F	G	F	G
Naphtha	NR	F	F	F	G
Naphthalene	G	G	E	G	E
Toluene	NR	F	G	F	G
Turpentine	F	G	E	F	G
Xylene	NR	F	G	F	G*
Halogenated hydrocarbons†					
Benzyl chloride	F	F	G	F	G
Carbon tetrachloride	F	F	G	F	G
Chloroform	F	F	G	F	G
Ethylene dichloride	F	F	G	F	G
Methylene chloride	F	F	G	F	G
Perchloroethylene	F	F	G	F	G
Trichloroethylene	F	F	G	F	G
Esters					
Amyl acetate	F	G	G	F	G
Butyl acetate	F	G	G	F	G
Ethyl acetate	F	G	G	F	G
Ethyl butyrate	F	G	G	F	G
Methyl butyrate	F	G	G	F	G
Ethers					
Diethyl ether	F	G	E	F	G
Aldehydes					
Acetaldehyde	G	E	E	E	E
Benzaldehyde	F	F	E	G	E
Formaldehyde	F	F	E	G	E
Ketones					
Acetone	G	G	G	F	G
Diethyl ketone	G	G	G	F	G
Methyl ethyl ketone	G	G	G	F	G
Alcohols					
Amyl alcohol	E	E	E	E	E
Butyl alcohol	E	E	E	E	E
Ethyl alcohol	E	E	E	E	E
Ethylene glycol	G	G	E	E	E
Glycerol	G	G	E	E	E
Isopropyl alcohol	E	E	E	E	E
Methyl alcohol	E	E	E	E	E
Amines					
Aniline	F	G	E	E	E
Butylamine	G	G	E	E	E
Ethylamine	G	G	E	E	E
Ethylaniline	F	G	E	E	E
Methylamine	G	G	E	E	E
Methylaniline	F	G	E	E	E
Triethanolamine	G	E	E	E	E
Miscellaneous					
Animal fats	F	G	G	G	E
Bleaches	NR	G	G	G	E
Carbon disulphide	NR	F	G	F	G
Degreasing solution	F	F	G	F	G
Diesel fuel	NR	F	G	F	E
Hydraulic fluids	F	G	G	G	E
Mineral oils	F	G	E	G	E
Ozone resistance	F	E	G	E	E
Paint and varnish removers	F	G	G	F	G
Petrol	NR	G	G	F	G
Photographic solutions	G	E	E	G	E
Plasticizers	F	G	E	G	E
Printing inks	G	G	E	G	E
Refrigerant solutions	G	G	E	F	G
Resin oil	F	G	G	G	E
Vegetable oils	F	G	G	G	E
Weed killers	G	E	E	G	E
White spirit	F	G	G	F	G
Wood preservatives	NR	G	G	F	G

* Resistance not absolute, but the best available.

† Aromatic and halogenated hydrocarbons will attack all types of natural and synthetic gloves. Should swelling occur, switch to another pair, allowing swollen gloves to dry and return to normal.

NATIONAL FIRE PROTECTION ASSOCIATION LABELS

Hazard Identification System. The diamond-shaped diagram shown for each chemical gives at a glance a general idea of the inherent hazards of the chemical and the order of severity of these hazards under emergency conditions such as spills, leaks and fires.



Diborane

Vinylidene Chloride

The diagram identifies the "health," "flammability" and "reactivity" (instability and water reactivity) of a chemical and indicates the order of severity of each hazard by use of one of five numeral gradings, from four (4), indicating the severe hazard or extreme danger, to zero (0), indicating no *special* hazard. In the diamond-shaped diagram "health" hazard is identified at the left, "flammability" at the top, and "reactivity" at the right.

The bottom space is primarily used to identify unusual reactivity with water. A W with a line through its center ₩ alerts fire fighting personnel to the possible hazard in use of water. This bottom space may be also used to identify a radiation hazard by the symbol ☢. Oxidizing chemicals are identified in the bottom space by OXY.

To supplement the spatial arrangement, NFPA No. 704M recommends the use of colored backgrounds or colored numbers to identify the hazard categories — blue for "health," red for "flammability," yellow for "reactivity." Examples of spatial arrangement and color schemes are shown on the preceding page.

For a detailed description of the hazard identification system used here, see "Recommended System for the Identification of the Fire Hazards of Materials, NFPA No. 704M, 1969 Edition."

The following paragraphs summarize the meanings of the numbers in each hazard category and explain what a number should tell fire fighting personnel about protecting themselves and how to fight fires where the hazard exists.

Health

4 A few whiffs of the gas or vapor could cause death; or the gas, vapor, or liquid could be fatal on penetrating the fire fighters' normal full protective clothing which is designed for resistance to heat. For most chemicals having a Health 4 rating, the normal full protective clothing available to the average fire department will not provide adequate protection against skin contact with these materials. Only special protective clothing designed to protect against the specific hazard should be worn.

3 Materials extremely hazardous to health, but areas may be entered with extreme care. Full protective clothing, including self-contained breathing apparatus, rubber gloves, boots and bands around legs, arms and waist should be provided. No skin surface should be exposed.

2 Materials hazardous to health, but areas may be entered freely with self-contained breathing apparatus.

1 Materials only slightly hazardous to health. It may be desirable to wear self-contained breathing apparatus.

0 Materials which on exposure under fire conditions would offer no health hazard beyond that of ordinary combustible material.

Flammability

4 Very flammable gases, very volatile flammable liquids, and materials that in the form of dusts or mists readily form explosive mixtures when dispersed in air. Shut off flow of gas or liquid and keep cooling water streams on exposed tanks or containers. Use water spray carefully in the vicinity of dusts so as not to create dust clouds.

3 Liquids which can be ignited under almost all normal temperature conditions. Water may be ineffective on these liquids because of their low flash points. Solids which form coarse dusts, solids in shredded or fibrous form that create flash fires, solids that burn rapidly, usually because they contain their own oxygen, and any material that ignites spontaneously at normal temperatures in air.

2 Liquids which must be moderately heated before ignition will occur and solids that readily give off flammable vapors. Water spray may be used to extinguish the fire because the material can be cooled to below its flash point.

1 Materials that must be preheated before ignition can occur. Water may cause frothing of liquids with this flammability rating number if it gets below the surface of the liquid and turns to steam. However, water spray gently applied to the surface will cause a frothing which will extinguish the fire. Most combustible solids have a flammability rating of 1.

0 Materials that will not burn.

Reactivity

4 Materials which in themselves are readily capable of detonation or of explosive decomposition or explosive reaction at normal temperatures and pressures. Includes materials which are sensitive to mechanical or localized thermal shock. If a chemical with this hazard rating is in an advanced or massive fire, the area should be evacuated.

3 Materials which in themselves are capable of detonation or of explosive decomposition or of explosive reaction, but which require a strong initiating source or which must be heated under confinement before initiation. Includes materials which are sensitive to thermal or mechanical shock at elevated temperatures and pressures or which react explosively with water without requiring heat or confinement. Fire fighting should be done from an explosion-resistant location.

2 Materials which in themselves are normally unstable and readily undergo violent chemical change but do not detonate. Includes materials which can undergo chemical change with rapid release of energy at normal temperatures and pressures or which can undergo violent chemical change at elevated temperatures and pressures. Also includes those materials which may react violently with water or which may form potentially explosive mixtures with water. In advanced or massive fires, fire fighting should be done from a protected location.

1 Materials which in themselves are normally stable but which may become unstable at elevated temperatures and pressures or which may react with water with some release of energy but not violently. Caution must be used in approaching the fire and applying water.

0 Materials which are normally stable even under fire exposure conditions and which are not reactive with water. Normal fire fighting procedures may be used.

For additional information on the material presented in this training program, refer to the following sources.

Dorland's Medical Dictionary, The Sanders Press, 1977.

Fire Sciences Dictionary, John Wiley and Sons, 1977.

Hazards In The Chemical Laboratory, Royal Society of Chemistry, 1981.

Material Safety Data Sheet, OSHA 2265, Occupational Safety and Health Administration, 1976.

The Condensed Chemical Dictionary, 10th Edition, Nan Nostrand Reinhold Co., 1981.